NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

NOAA In Your State

Michigan

***NOAA** is an agency that enriches life through science. Our reach goes from the surface of the sun to the depths of the ocean floor as we work to keep citizens informed of the changing environment around them. From daily weather forecasts, severe storm warnings, and climate monitoring to fisheries management, coastal restoration and supporting marine commerce, NOAA's products and services support economic vitality and affect more than one-third of America's gross domestic product. NOAA's dedicated scientists use cutting-edge research and high-tech instrumentation to provide citizens, planners, emergency managers and other decision makers with reliable information they need when they need it.*

The following is a summary of NOAA facilities, staff, programs, or activities based in, or focused on, your state or territory: Starting with highlights, then by congressional districts and cities or towns, Great Lakes programs, and then statewide programs.

Highlights of NOAA in Michigan

Lake Michigan Field Station	Muskegon	MI-2
Marine Instrumentation Laboratory	South Haven	MI-6
Great Lakes Environmental Research Laboratory	Ann Arbor	MI-12
Thunder Bay National Marine Sanctuary	Lake Huron	MI

The state of Michigan also has one Cooperative Institute, four Weather Forecast Offices, three Labs and Field Offices, three Science on a Sphere® exhibitions, and one Habitat Focus Area.

Weather Forecast Offices

Gaylord	MI-1
Marquette	MI-1
Grand Rapids	MI-3
White Lake/Metro Detroit	MI-11

National Weather Service (NWS) Weather Forecast Offices (WFO) are staffed 24/7/365 and provide weather, water, and climate forecasts and warnings to residents of Michigan. There are 122 WFOs nationwide of which four are in Michigan. Highly trained forecasters issue warnings and forecasts for weather events, including severe thunderstorms, tornadoes, hurricanes, winter storms, floods, and heat waves to the general public, media, emergency management and law enforcement officials, the aviation and marine communities, agricultural interests, businesses, and others. Information is disseminated in many ways, including wireless emergency alerts, social media,weather.gov, and NOAA Weather Radio All Hazards. Each WFO has a Warning Coordination Meteorologist who actively conducts outreach and educational programs that strengthen working relationships with local partners in emergency management, government, the media and academic communities. Forecasters provide Impact-based Decision Support Services (IDSS), both remotely and on-site during critical emergencies such as wildfires, floods, chemical spills, and major recovery efforts. To gather data for forecasting and other purposes, NWS WFO staff monitor, maintain and use Automated Surface Observing Stations and Doppler Weather Radar. In addition to the WFOs, NWS operates specialized national prediction centers and regional headquarters throughout the U.S. for a total of 168 operational units. Over 85% of NWS' workforce is in the field. For current Michigan weather, visit www.weather.gov and, on the national map, click on the relevant county or district.

Science On a Sphere®

Alpena	MI-1
Kalamazoo	MI-6
East Lansing	MI-8
Royal Oak	MI-9

Science On a Sphere (SOS) is a room-sized global display system that uses computers and video projectors to display planetary data onto a six-foot diameter sphere, analogous to a giant animated globe. Researchers at NOAA developed Science On a Sphere® as an educational tool to help illustrate Earth System science to people of all ages. Animated images of atmospheric storms, climate change, and ocean temperature can be shown on the sphere, which is used to explain in a way that is simultaneously intuitive and captivating what are sometimes complex environmental processes. They are located at the Great Lakes Maritime Heritage Center in Alpena, Valley Museum in Kalamazoo, and Detroit Zoo in Royal Oak.

MI-1, 2, 5, 6, 10
Muskegon, Alpena, South Haven, Saginaw
Office of Oceanic and Atmospheric Research (OAR) - Real-time Environmental Coastal Observation Network Stations

The goal of the Great Lakes Environmental Research Laboratory's Real-time Environmental Coastal Observation Network (RECON) project is to develop a national network of low cost coastal buoys capable of seabed to sea-surface observations. This wireless Internet observation system, with shore stations at coastal locations covering approximately 800 square miles of sea surface, uses commercially available networking equipment allowing straightforward integration into a nationwide network. The seasonal buoys are located offshore of Muskegon, MI in Lake Michigan, and in Saginaw Bay and Thunderbay, in Lake Huron. The buoys collect meteorological data air data (wind direction, barometric pressure, wind speed, maximum wind speed, air temperature; water near-surface data) and provides lake surface and sub surface measurements of chemical, biological, and physical parameters including water temperature, significant wave height, maximum wave height, dissolved oxygen, and conductivity. The system is designed to allow controlled access to multi-institutional users through surface buoys and sub-surface sensor guest ports located on an underwater hub. The observation network currently provides environmental data to state, federal, and university researchers, educators and resource managers.

Alpena

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including Alpena, MI. The Alpena station measures/records wind speed, max wind speed, wind direction, and air temperature, and wind chill at 2-minute increments updated twice per hour. In addition there is a webcam with four views, images are updated six times per hour, six hour animation loops of these images are also posted.

Chatham

Office of Oceanic and Atmospheric Research (OAR) - U.S. Climate Reference Network

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

Cheboygan

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including one on the Spectacle Reef Light offshore of Cheboygan, Michigan. The Spectacle Reef Light station measures/records wind speed, wind direction, and air temperature, relative humidity, dew point, barometric pressure, incident solar radiation and surface water temperature at 2-minute increments updated twice per hour. In addition there is a webcam with four views, images are updated six times per hour, six hour animation loops of these images are also posted.

Gaylord

Office of Oceanic and Atmospheric Research (OAR) - U.S. Climate Reference Network

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

National Weather Service (NWS) - Weather Forecast Office- See Page 2 for detail.

Mackinaw City

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including one the White Shoal Light offshore of Mackinaw City, Michigan. The White Shoal Light station measures/records wind speed, wind direction, and air temperature, relative humidity, dew point, barometric pressure, incident solar radiation and surface water temperature at 2-minute increments updated twice per hour. In addition there is a webcam with four views, images are updated six times per hour, six hour animation loops of these images are also posted.

Marquette

National Weather Service (NWS) - Weather Forecast Office- See Page 2 for detail.

Sault Ste. Marie

National Ocean Service (NOS) - Soo Locks PORTS®

A Physical Oceanographic Real-Time System (PORTS®) is operated cooperatively with the U.S. Army Corps of Engineers and provides real-time data quality-controlled and disseminated to local users for safe and efficient navigation. Real-time data are available for water levels from seven stations and meteorological data from six locations.

Thunder Bay Island

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including on Thunder Bay Island, offshore of Alpena, MI. The Thunder Bay Island station measures/records wind speed, max wind speed, wind direction, and air temperature at 2-minute increments updated twice per hour. In addition there is a webcam with four views, images are updated six times per hour, six hour animation loops of these images are also posted.

Traverse City

National Ocean Service (NOS) – Office for Coastal Management

The NOAA Office for Coastal Management practices a partner-based, boots on the ground approach to coastal management. The organization currently has staff in the eight regions who provide assistance to local, state, and regional coastal resource management efforts and facilitate customer feedback and assessments. Great Lakes regional staff are located in Chanhassen and Duluth, MN, Chicago, IL and Traverse City, MI. In addition to providing NOAA products and services, these staff represent NOAA on multiple regional governance structures, including but not limited to, theGreat Lakes Restoration Initiative and the Great Lakes Regional Collaboration to improve the management of natural resources.

MI-1 through 10

Great Lakes and tributary cities

National Ocean Service (NOS) - Great Lakes Real-Time Currents Monitoring

The Center for Operational Oceanographic Products and Services (CO-OPS) collects, analyzes, and distributes observations and predictions of currents. The goals are to ensure safe, efficient and environmentally sound maritime commerce, and to support environmental needs such as HAZMAT response. The principal product generated by this

program is information used to maintain and update the Tidal Current Tables. There is one real-time current meter operating in Michigan at the St. Clair River.

MI-1

NOAA Office of Education - Environmental Literacy Program

NOAA's Environmental Literacy Program (ELP), administered by the Office of Education, provides grants and in-kind support to advance NOAA's mission through formal (K-12) and informal education. In Michigan, ELP supports the Great Lakes Maritime Heritage Center (Alpena), which has a permanent exhibit featuring NOAA's Science On a Sphere (SOS) and is a member of NOAA's SOS Users Collaborative Network (SOS Network). The SOS Network connects over 150 science education institutions worldwide to the latest NOAA data as part of a focused effort to increase environmental literacy at all ages.

MI-2

Muskegon

Office of Oceanic and Atmospheric Research (OAR) – GLERL Lake Michigan Field Station

The NOAA Great Lakes Environmental Research Laboratory (GLERL) Lake Michigan Field Station (LMFS) is strategically located on the eastern shore of Lake Michigan in Muskegon, Michigan. The LMFS serves as the home base for field operations, research, and GLERL vessel operations - critical assets in providing physical access to the Great Lakes and advancing NOAA's mission in the region. Located on Lake Michigan's Muskegon Channel, GLERL's field station occupies three buildings. There are currently 12 employees at the facility, including research staff, vessel crew, a marine superintendent, and administrative personnel. Additionally, the proximity of the field station to Lake Michigan provides a unique opportunity for engagement with tourists, recreational users, and members of the community.

Office of Oceanic and Atmospheric Research (OAR) - Real Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of shore-based meteorological instrument packages including locations on Lake Michigan. The meteorological observations obtained from the network are being used in GLERL's Great Lakes Coastal Forecasting System to improve nowcasts and forecasts of wind, waves, water levels, ice cover and circulation. The Muskegon station measures wind speed, max wind speed, wind direction, air temperature, dew point, relative humidity, station pressure, sea level pressure, and PAR at 2-minute increments. Additionally there are four Muskegon webcams, images are updated six times per hour.

Office of Oceanic and Atmospheric Research (OAR), National Marine Fisheries Service (NMFS), National Ocean Service (NOS) - Muskegon Lake Habitat Focus Area

As part of the Habitat Blueprint administered by the NOAA Fisheries Office of Habitat Conservation, NOAA has selected ten Habitat Focus Areas (HFAs), place-based locations across the country to maximize the effectiveness of habitat conservation. While each HFA focuses on individual habitat conservation goals outlined in their Implementation Plan, the overarching goal is to demonstrate results in a focused area in a short time period. Muskegon Lake has been selected as a Habitat Focus Area The Muskegon Lake watershed has been a center for industrial activity since the late 1800s. To address the impact of this industrial legacy, the Muskegon Lake Habitat Focus Area team has identified a number of objectives they will target over the next five years including addressing loss of fish and wildlife habitat within Muskegon and Bear lakes, rebuilding sport fisheries and populations of aquatic organisms to sustainable levels, and increasing coastal tourism, access and recreation opportunities.

NOAA Commissioned Officer Corps (NOAA Corps) - GLERL Field Station and Vessel Operations Coordinator
The NOAA Commissioned Officer Corps stations an officer at the Great Lakes Environmental Research Laboratory in support of small boat operations and scientific research at the Laboratory. This officer serves as the small boat vessel operations coordinator, managing administrative tasks for the labs vessels along with other operational duties. They assist with the execution of science projects and facilitate vessel user objectives, becoming an integral link between the scientific and operational sides of the Lab. In addition, the officer is the liaison for the Lab to the co-located USCG Station, ensuring cooperation with all projects and operations undertaken by the Lab. Other duties include assisting in an ongoing effort to catalogue Great Lakes research vessels, their mission capabilities, material condition, and stakeholder requirements; assisting with customer support through development of new tools to communicate the group and vessel capabilities; and managing facility safety, operations, and shared service across multiple GLERL Branches.

MI-3
Grand Rapids
National Weather Service - Weather Forecast Office-See Page 2 for detail.

MI-6
Kalamazoo
Office of Oceanic and Atmospheric Research (OAR) – Science On a Sphere®- See Page 2 for detail.

NOAA Office of Education — Environmental Literacy Program
NOAA's Environmental Literacy Program (ELP), administered by the Office of Education, provides grants and in-kind support to advance NOAA's mission through formal (K-12) and informal education. In Michigan, ELP supports the Kalamazoo Valley Museum (Kalamazoo), which has a permanent exhibit featuring NOAA's Science On a Sphere (SOS) and is a member of NOAA's SOS Users Collaborative Network (SOS Network). The SOS Network connects over 150 science education institutions worldwide to the latest NOAA data as part of a focused effort to increase environmental literacy at all ages.

South Haven
Office of Oceanic and Atmospheric Research (OAR) – Marine Instrumentation Laboratory
The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of shore-based meteorological instrument packages including locations on Lake Michigan. The meteorological observations obtained from the network are being used in GLERL's Great Lakes Coastal Forecasting System to improve nowcasts and forecasts of wind, waves, water levels, ice cover and circulation. The South Haven station measures wind speed, max wind speed, wind direction, air temperature, dew point, relative humidity, station pressure, sea level pressure, and PAR at 2-minute increments. Additionally there are two South Haven webcam views, images are updated six times per hour.

MI-8
East Lansing
Office of Oceanic and Atmospheric Research (OAR) - Science On a Sphere®- See Page 2 for detail.

NOAA Office of Education — Environmental Literacy Program
NOAA's Environmental Literacy Program (ELP), administered by the Office of Education, provides grants and in-kind support to advance NOAA's mission through formal (K-12) and informal education. In Michigan, ELP supports Michigan State University's MSU Museum (Ingham), which has a permanent exhibit featuring NOAA's Science On a Sphere (SOS) and is a member of NOAA's SOS Users Collaborative Network (SOS Network). The SOS Network connects over 150

science education institutions worldwide to the latest NOAA data as part of a focused effort to increase environmental literacy at all ages.

MI-9
Royal Oak

Office of Oceanic and Atmospheric Research (OAR) - Science On a Sphere®- See Page 2 for detail.
Science On a Sphere (SOS) is a room-sized global display system that uses computers and video projectors to display planetary data onto a six foot diameter sphere, analogous to a giant animated globe. Researchers at NOAA developed Science On a Sphere® as an educational tool to help illustrate Earth System science to people of all ages. Animated images of atmospheric storms, climate change, and ocean temperature can be shown on the sphere which is used to explain complex environmental processes in a way that is simultaneously intuitive and captivating.

NOAA Office of Education — Environmental Literacy Program
NOAA's Environmental Literacy Program (ELP), administered by the Office of Education, provides grants and in-kind support to advance NOAA's mission through formal (K-12) and informal education. In Michigan, ELP supports the Detroit Zoological Society (Oakland), which has a permanent exhibit featuring NOAA's Science On a Sphere (SOS) and is a member of NOAA's SOS Users Collaborative Network (SOS Network). The SOS Network connects over 150 science education institutions worldwide to the latest NOAA data as part of a focused effort to increase environmental literacy at all ages.

MI-11
White Lake/Metro Detroit

National Weather Service (NWS) - Weather Forecast Office- See Page 2 for detail.

National Ocean Service (NOS) - Navigation Manager
NOAA's navigation managers work directly with pilots, port authorities, and recreational boating organizations in Michigan. They help identify the navigational challenges facing marine transportation in Michigan and provide NOAA's resources and services that promote safe and efficient navigation. Navigation managers are on call to provide expertise and NOAA navigation response coordination in case of severe coastal weather events or other marine emergencies. The Office of Coast Survey has a navigation manager in Cleveland, OH, to support mariners and stakeholders in the Great Lakes.

National Ocean Service (NOS) - Navigation Response Team
The Office of Coast Survey (OCS) maintains the nation's nautical charts and publications for U.S. coasts and the Great Lakes. OCS navigation managers are strategically located in U.S. coastal areas to provide regional support to federal and state agencies in order to assist with navigational challenges. The Office of Coast Survey's Navigation Response Branch (NRB) conducts routine and emergency hydrographic surveys; and working with the regional Navigation Managers, navigation response teams (NRT) work around-the-clock after storms to speed the reopening of ports and waterways. During emergency response, the NRTs provide time-sensitive information to the U.S. Coast Guard or port officials, and transmit data to NOAA cartographers for updating the Coast Survey's suite of navigational charts. Mobile integrated survey team (MIST) can be applied to a vessel of opportunity to provide response capability in the Great Lakes.

MI-12
Ann Arbor

NOAA Office of Education — Environmental Literacy Program
NOAA's Environmental Literacy Program (ELP), administered by the Office of Education, provides grants and in-kind support to advance NOAA's mission through formal (K-12) and informal education. In Michigan, ELP funded the University of Michigan's Sea Grant (Washtenaw) to build the environmental literacy of children, youth, and adults so they are

knowledgeable of the ways in which their community can become more resilient to extreme weather, climate change, and other environmental hazards, and become involved in achieving that resilience. The funded project, in partnership with Eastern Michigan University's Southeast Michigan Stewardship Coalition and EcoWorks, is working with high school educators and students from the Detroit metropolitan area to increase awareness, knowledge and understanding of climate-related hazards. Using NOAA assets, including the Great Lakes Integrated Science and Assessments' climate data and Sea Grant education and outreach expertise, educators and students are partnering with climate scientists to explore, through project-based learning, local climate impacts and to develop comprehensive strategies that protect vulnerable neighborhoods and households.

Office of Oceanic and Atmospheric Research (OAR) – Great Lakes Regional Integrated Sciences and Assessments
The Great Lakes Integrated Sciences and Assessments (GLISA) is a cooperative agreement between NOAA's Climate Program Office (CPO) and the University of Michigan. It is one of several Regional Integrated Sciences and Assessments (RISA) teams contributing to the development of knowledge, expertise, and abilities of decision-makers to plan and prepare for climate variability and change. GLISA integrates information from a wide array of scientific fields, develops collaborations between entities with similar goals, and helps inform decision makers throughout the region with sound science. GLISA offers a unique approach to building climate literacy, long-term sustainability, and facilitating smart decision-making across the eight Great Lakes states (Minnesota, Wisconsin, Illinois, Indiana, Ohio, Michigan, New York, and Pennsylvania) and the province of Ontario. GLISA focuses on three critical sectors in the Great Lakes region—agriculture, watershed management, and natural resources-based recreation and tourism—which are interconnected through issues of water quality and quantity. The two overarching goals of GLISA are to contribute to the long-term sustainability of the region in the face of a changing climate and to improve the utility of scientific knowledge in decision making. Core partners of GLISA include the University of Michigan and Michigan State University.

Office of Oceanic and Atmospheric Research (OAR) - Cooperative Institute for Great Lakes Research
The Cooperative Institute for Great Lakes Research (CIGLR) was established at the University of Michigan. CIGLR serves as a mechanism to promote collaborative research between university scientists and those in NOAA. The mission of CIGLR is to lead exciting new research, train the next generation of scientists, and turn research into action for safe and healthy Great Lakes communities. The primary NOAA research partner of CIGLR is the Great Lakes Environmental Research Laboratory. CIGLR also collaborates with NOAA's Office of Oceanic and Atmospheric Research, National Ocean Service, National Weather Service, and National Environment Satellite, Data, and Information Service. Consortium members include Central Michigan University, Cornell University, Grand Valley State University, Michigan State University, Ohio State University, University of Minnesota-Duluth, University of Windsor, and University of Wisconsin-Milwaukee. CIGLR conducts research across four themes: (1) observing systems and advanced technology; (2) invasive species and food-web ecology; (3) hydrometeorological and ecosystem forecasting; and (4) protection and restoration of resources.

Office of Oceanic and Atmospheric Research (OAR) - Great Lakes Coastal Forecast System
The Great Lakes Coastal Forecasting System is useful to all users of the Great Lakes coastal waters who require real-time information and forecasts of air and water temperatures, currents, water levels, ice cover, cloud cover, simulated river particular tracks, and waves. Physical processes have a major impact on environmental, chemical, and biological processes and influence many other types of user activities, such as water supply management, wastewater management, power plant sightings, shipping, recreational and commercial boating and fishing, shoreline erosion and redistribution of sedimentary material. Planners and managers responsible for any part of the Great Lakes ecosystem that is affected by lake circulation, such as transport of toxic material or nutrient enrichment processes have full access to the

information provided by Great Lakes Coastal Forecast System (GLCFS web site) to assist them in the decision making process.

Office of Oceanic and Atmospheric Research (OAR) - Great Lakes Environmental Research Laboratory
The Great Lakes Environmental Research Laboratory (GLERL) is a scientific research facility based in Ann Arbor, Michigan, operating as part of the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR). GLERL's Ann Arbor facility houses experimental and marine instrumentation laboratories furnished with state-of-the-art equipment and technology to support GLERL's scientific research. GLERL's research capacity is further strengthened by its in-house partnership with NOAA's Great Lakes Cooperative Institute, comprised of a consortium of academic institutions in the region. In addition, NOAA's Great Lakes Sea Grant Network serves as a vital in-house partnership that functions to connect NOAA research to the communication and outreach capabilities of NOAA Sea Grant.

Office of Oceanic and Atmospheric Research (OAR) - Uncrewed Systems Research Transition Office (USRTO) Project
Uncrewed Aircraft Systems (UAS) are used by NOAA to monitor and understand the global environment and bridge the gap measurements made on Earth's surface and on satellites. NOAA Great Lakes Environmental Research Laboratory (GLERL) monitors and studies cyanobacteria harmful algal blooms in Lake Erie and other parts of the Great Lakes. GLERL and partners have developed a UAS for use in the region that provides critical monitoring data on cyanobacteria harmful algal blooms in the western basin of Lake Erie, supporting the Lake Erie HAB forecast.

Office of Oceanic and Atmospheric Research (OAR) - CoastWatch
The NOAA CoastWatch Great Lakes regional node obtains, produces, and delivers environmental data and products for near real-time observation of the Great Lakes to support environmental science, decision making, and supporting research. This is achieved by providing Internet access to near real-time and retrospective satellite data and products, as well as in-situ Great Lakes data. The CoastWatch node at Great Lake Environmental Research Laboratory provides clients including Federal, state, and local agencies, academic institutions, commercial/industries, and the public, both within and outside of the Great Lakes region, with access to near real-time satellite observations and in-situ data for the Great Lakes. CoastWatch data are used in a variety of ways, including near real-time observation and tracking of algal blooms, plumes, ice cover, wind speed/direction, surface water intake temperatures at fish hatcheries, two and three dimensional modeling of Great Lakes physical parameters, such as wave height and currents, damage assessment modeling, research, and educational and recreational activities. In addition, through a cooperative project with Michigan Sea Grant, Great Lakes CoastWatch satellite-derived surface water temperature imagery is contoured and made available via Michigan State Sea Grant's website. Great Lakes CoastWatch data and products benefit riparians as well as research, operational, and recreational users.

MI-15
Ann Arbor
National Ocean Service (NOS) - Centers of Excellence
The Center of Excellence for Great Lakes and Human Health (CEGLHH) focuses on understanding the inter-relationships between the Great Lakes ecosystem, water quality and human health. The Center employs a multidisciplinary approach to understand and forecast coastal-related human health impacts for natural resource and public policy decision-making, and develop tools to reduce human health risks associated with three research priority areas: beach closures, harmful algal blooms, and drinking water quality.

Statewide

National Marine Fisheries Service (NMFS) - Restoration Center

The NOAA Restoration Center, within the Office of Habitat Conservation, works with private and public partners locally and nationwide to increase fisheries productivity by restoring coastal habitat. Projects support sustainable fisheries, help recover threatened and endangered species, and reverse damage from disasters like oil spills, ship groundings, and severe storms. In the Great Lakes, the NOAA Restoration Center focuses on restoring the most degraded environments--designated Areas of Concern. Our projects address loss of habitat and diminished fish and wildlife populations. Since 2008, we have targeted roughly $40 million to restore more than 5200 acres of habitat for fish and wildlife and opened more than 780 miles of river for fish passage. NOAA is also working with the Great Lakes Restoration Initiative to implement habitat restoration projects that will help improve Areas of Concern.

National Marine Fisheries Service (NMFS) and National Ocean Service (NOS) - Damage Assessment, Remediation, and Restoration Program

NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP) assesses and restores habitat, fisheries, protected species and recreational uses that have been harmed by oil spills, chemical releases, and ship groundings. Working with federal, state, and tribal entities, and responsible parties, we have recovered funding from responsible parties for restoration of critical habitats, fisheries, protected species and recreational uses nationwide. These projects promote recovery of the ecosystem and provide economic benefits from tourism, recreation, green jobs, coastal resiliency, property values and quality of life. In Minnesota, the Program is currently working to restore natural resources in cases including the St. Louis River/Interlake and the St. Louis River/U.S. Steel hazardous waste sites.

National Weather Service - **NEXRAD (WSR-88D) Systems**

NEXRAD is used to warn the people of the United States about dangerous weather and its location. This radar technology allows meteorologists to warn the public to take shelter with more notice than ever before. The NEXRAD network provides significant improvements in severe weather and flash flood warnings, air traffic safety, flow control for air traffic, resource protection at military bases, and management of water, agriculture, forest, and snow removal. NEXRAD radar has a range of up to 250 nautical miles, and can provide information about wind speed and direction, as well as the location, size, and shape of precipitation. There are 159 operational NEXRAD radar systems deployed throughout the United States and overseas, of which four are in Michigan.

National Weather Service (NWS) - Automated Surface Observing Systems Stations

The Automated Surface Observing Systems (ASOS) program is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). ASOS serves as the Nation's primary surface weather observing network. ASOS is designed to support weather forecast activities and aviation operations and, at the same time, support the needs of the meteorological, hydrological, and climatological research communities. ASOS works non-stop, updating observations every minute, 24 hours a day, every day of the year observing basic weather elements, such as cloud cover, precipitation, wind, sea level pressure, and conditions, such as rain, snow, freezing rain, thunderstorms, and fog. There are 27 ASOS stations in Michigan.

National Weather Service (NWS) - Cooperative Observer Program Sites

The National Weather Service (NWS) Cooperative Observer Program (COOP) is the Nation's weather and climate observing network of, by and for the people. More than 10,000 volunteers take observations on farms, in urban and suburban areas, National Parks, seashores, and mountaintops. The data are representative of where people live, work and play. The COOP was created to provide observational meteorological data required to define the climate of the United

States and to help measure long-term climate changes, and to provide observational meteorological data in near real-time to support forecast, warning and other public service programs of the NWS. The data are also used by other federal, state and local entities, as well as private companies. In some cases, the data are used to make billions of dollars' worth of decisions. For example, the energy sector uses COOP data to calculate the Heating and Cooling Degree Days which are used to determine individuals' energy bills monthly. There are 365 COOP sites in Michigan.

National Weather Service (NWS) - NOAA Weather Radio All Hazards Transmitters
NOAA Weather Radio All Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service (NWS) forecast office. NWR broadcasts official NWS warnings, watches, forecasts and other hazard information 24 hours a day, 7 days a week. Working with the Federal Communication Commission's (FCC) Emergency Alert System, NWR is an "All Hazards" radio network, making it the single source for comprehensive weather and emergency information. In conjunction with federal, state, and local emergency managers and other public officials, NWR also broadcasts warning and post-event information for all types of hazards – including natural (such as earthquakes or avalanches), environmental (such as chemical releases or oil spills), and public safety (such as AMBER alerts or 911 Telephone outages). Known as the "Voice of NOAA's National Weather Service," NWR is provided as a public service by the NWS. NWR includes 1,100 transmitters covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. There are 28 NWR transmitters in Michigan.

National Ocean Service (NOS) - National Water Level Observation Network
NOS operates 28 long-term continuously operating water level stations in the state of Michigan which provide data and information on Great Lakes and interconnecting waterways data and lake level regulation and are capable of producing real-time data for storm surge warning. These stations are located at Menominee, Port Inland, Port Iroquois, Marquette, Ontonagon, Algonac, St Clair St Police, Dry Dock, Mouth of the Black River, Dunn Paper, Fort Gratiot, St Clair Shores, Gibraltar, Wyandotte, Fort Wayne, Windmill Point, Fermi Power Plant, Lakeport, Harbor Beach, Essexville, Alpena, Mackinaw City, De Tour Village, Rock Cut, West Neebish Island, Little Rapids, Ludington and Holland.

National Ocean Service (NOS) - Great Lakes Bay Watershed Education Training Program
The NOAA Bay Watershed Education and Training (B-WET) program is an environmental education program that promotes locally relevant, experiential learning in the K-12 environment. The primary delivery of B-WET is through competitive funding that promotes Meaningful Watershed Educational Experiences (MWEEs). B-WET currently serves seven areas of the country: California, Chesapeake Bay, Great Lakes, Gulf of Mexico, Hawai'i, New England, and the Pacific Northwest. The Great Lakes B-WET program recognizes that knowledge and commitment built from firsthand experience, especially in the context of one's community and culture, is essential for achieving environmental stewardship. Great Lakes B-WET responds to regional education and environmental priorities through local implementation of competitive grant funds. Please see regional funding opportunities for priorities and eligibility details.

National Ocean Service (NOS) - Thunder Bay National Marine Sanctuary
Located in northwestern Lake Huron, Thunder Bay is adjacent to one of the most treacherous stretches of water within the Great Lakes system. Unpredictable weather and rocky shoals earned the area the name, "Shipwreck Alley." Today, the 4,300 square mile Thunder Bay National Marine Sanctuary protects one of America's best preserved and nationally significant collections of shipwrecks. Fire, ice, collisions, and storms have claimed ships in and around Thunder Bay. To date, 99 historic shipwrecks have been discovered in the waters adjacent to Alpena, Alcona, and Presque Isle counties, and five shipwrecks off Mackinaw and Cheboygan counties. Protection and management of the sanctuary is entirely focused on this extraordinary collection of underwater cultural resources and historic research indicates that as many as 100 additional shipwrecks may yet be found within the sanctuary's waters. Thunder Bay National Marine Sanctuary in

Lake Huron encompasses 4,300 square miles, protecting 99 known historic shipwrecks in Alpena, Alcona and Presque Isle counties, and five shipwrecks from Mackinaw and Cheboygan counties. Protection and management of the sanctuary is entirely focused on Thunder Bay's extraordinary collection of underwater cultural resources (primarily shipwrecks). Dubbed "Shipwreck Alley," historic research indicates that as many as 100 additional shipwrecks may be found in the treacherous waters around Thunder Bay. Intense weather patterns, islands, and rocky shoals, and heavy vessel traffic, and converging shipping lanes all contributed to the area's vast collection of shipwrecks. These submerged archaeological sites are nearly a complete collection of Great Lakes vessel types from small schooners and pioneer steamboats of the 1830s, to enormous industrial bulk carriers that supported the Midwest's heavy industries during the twentieth century.
Well preserved by Lake Huron's cold, fresh water of the Great Lakes, the shipwreck sites are a haven for historians, archaeologists, and the public. The sanctuary's waters are important to the local economy as a destination for snorkeling, diving, boating, and paddling kayaking. Additionally, NOAA's 20,000 square foot visitor center for the sanctuary, the Great Lake Marine Heritage Center in Alpena, brings nearly 100,000 visitors to the region annually. Through research, education and community involvement the sanctuary seeks to protect these unique and non-renewable historic sites for future generations.

National Ocean Service (NOS) – National Coastal Zone Management Program
Through a unique federal-state partnership, NOAA's Office for Coastal Management works with the Michigan Department of Environmental, Great Lakes, and Energy to implement the National Coastal Zone Management Program in Michigan. NOAA provides the state coastal management program with financial and technical assistance to further the goals of the Coastal Zone Management Act and ensure coastal waters and lands are used in a balanced way to support jobs, reduce use conflicts, and sustain natural resources.

National Ocean Service (NOS) – Digital Coast
The Digital Coast is a focused information resource developed to meet the unique needs of coastal communities. Developed and maintained by NOAA's Office for Coastal Management, content comes from hundreds of organizations, including federal, state, and local agencies, plus private sector and non-profit contributors. The Digital Coast website provides not only site-specific coastal data, but also related the tools, training, and information needed to make these data useful for coastal decision makers.

National Ocean Service (NOS) - National Estuarine Research Reserve Science Collaborative
The National Estuarine Research Reserve Science Collaborative is a partnership between NOAA and the University of Michigan Water Center. The Science Collaborative supports user-driven collaborative research that addresses coastal management issues important to the National Estuarine Research Reserve System and coastal decision-makers. Research focus areas include climate change, water quality, habitat restoration, ecosystem service valuation, and synthesis of monitoring data.

National Ocean Service (NOS) - Coastal and Estuarine Land Conservation Program
The Coastal and Estuarine Land Conservation Program (CELCP) brings conservation partners together to protect coastal and estuarine lands considered important for their ecological, conservation, recreational, historical, or aesthetic values. Subject to availability of funding, the program provides state and local governments with matching funds to purchase coastal and estuarine lands or obtain conservation easements for important lands threatened by development. Since 2002, the program has protected more than 110,000 acres of coastal land nationally, including over 16,000 acres protected as in-kind matching contributions. Seven projects have been successfully completed in Michigan, four with CELCP funding, and another three with funds from EPA's Great Lakes Restoration Initiative.

National Ocean Service (NOS) – National Coastal Resilience Fund

The National Coastal Resilience Fund is a partnership effort between NOAA and the National Fish and Wildlife Foundation (NFWF) to restore, increase, and strengthen natural infrastructure to protect coastal communities, while also enhancing habitat for fish and wildlife. In Michigan, three projects have been funded, one each in FY18-FY20.

National Ocean Service (NOS) - Scientific Support Coordinator and Regional Resource Coordinator
NOAA's Office of Response and Restoration (OR&R) brings decades of experience, technical expertise and scientific analysis in response to oil and hazardous chemical spills. Eleven regionally based Scientific Support Coordinators (SSCs) harness the input of a multi-disciplinary team to address issues such as oil slick trajectory forecasting, environmental tradeoffs, best practices, resources at risk, oil science and properties, and chemical hazard assessment to reduce risks to coastal habitats and resources. The SSC works directly with the U.S. Coast Guard and the U.S. Environmental Protection Agency to provide critical scientific support to the Federal On-Scene Coordinator. OR&R also helps develop preparedness plans that identify spill response actions with the greatest environmental benefit and trains hundreds of members of the response community each year on the scientific and technical aspects of spills.

OR&R's Regional Resource Coordinators (RRCs) provide scientific and technical expertise and timely response to oil spills or hazardous materials releases to collect information, samples, and evidence that are time dependent and critical to support natural resource damage assessments throughout the coastal US. RRCs work on multi-disciplinary scientific, economic, and legal teams and are responsible for determining and quantifying injuries to NOAA trust natural resources through determination of injuries and pathway, and demonstration of causal mechanisms. The goal of the RRCs efforts is to determine, often through the Damage Assessment, Remediation, and Restoration Program, the appropriate amount and type of restoration required to restore injured NOAA trust resources and compensate the public for their lost use. To date, DARRP and co-trustees have recovered over $91M for restoration of natural resources injured by one oil spill and two waste sites in Michigan.

National Ocean Service (NOS) – OR&R Environmental Response Management Application
Assessing important spatial information and designing successful restoration projects rely upon interpreting and mapping geographic information, including the location, duration, and impacts from oil spills, other hazardous materials, or debris released into the environment. Great Lakes Environmental Response Management Application (ERMA®) is an online mapping tool that integrates both static and real-time data, such as Environmental Sensitivity Index maps, ship locations, weather, and ocean currents in a centralized, easy-to-use format for environmental responders and decision makers.

National Ocean Service (NOS) – OR&R Environmental Sensitivity Index (ESI) maps/data
Environmental Sensitivity Index (ESI) maps are an OR&R product that provides oil spill responders and planners with a concise summary of coastal resources that could be at risk if an oil spill occurs nearby. ESI maps were originally created for the Great Lakes between 1985-1994 (depending on region) and had not been updated for decades due to limited resources. In 2020, with funding from the EPA through the Great Lakes Restoration Initiative, OR&R completed an update of the sensitivity maps/data for the Straits of Mackinac and the St. Clair-Detroit River System. OR&R recently established a new agreement with the U.S. Coast Guard to update the ESI maps for two more regions: St. Marys River, connecting Lake Superior to Lake Huron, and St. Lawrence River, from its start in Lake Ontario to the U.S./Canadian Border. These ESI updates will be completed by mid-2021. Spill responders and planners for the Great Lakes region and Canada will benefit from the updated sensitivity data. OR&R continues to seek opportunities to update these key components of emergency response planning, preparedness, and response. When completed, the ESI maps and data will be available for download from the OR&R website, as well as included in the Environmental Response Management Application (ERMA®) for the Great Lakes.

National Ocean Service (NOS) - OR&R Marine Debris Program (MDP)
The NOAA Marine Debris Program (MDP) leads national and international efforts to research, prevent, and reduce the impacts of marine debris. The program supports marine debris removal, prevention, and research projects in partnership with state and local agencies, tribes, non-governmental organizations, academia, and industry. The MDP Great Lakes Regional Coordinator supports coordination efforts with regional stakeholders, provides support to grant-funded projects, tracks progress of projects, and conducts regional marine debris outreach to local audiences. In Michigan, the MDP is partnering with the Community Foundation of Northeast Michigan and other partners to tackle the issue of lunchroom waste in local schools. Students will learn about marine debris, examine the amount of waste they produce at school, and develop potential solutions for the school districts to consider to reduce waste. The MDP has also worked with Great Lakes stakeholders to develop the Great Lakes Marine Debris Action Plan, which provides a road map for strategic progress in making the Great Lakes, its coasts, people, and wildlife free from the impacts of marine debris.

National Ocean Service (NOS) - U.S. Integrated Ocean Observing System (Great Lakes Observing System)
The U.S. Integrated Ocean Observing System, or IOOS®, is a federally and regionally coordinated observing system with 17 interagency and 11 regional partners. The System addresses regional and national needs for coastal, ocean, and Great Lakes data and information. This includes gathering and disseminating regional observations; data management; modeling and analysis; education and outreach; and research and development.The U.S. Integrated Ocean Observing System (IOOS®) is an operational system and a network of regional partners responsible for regional observations, data management, modeling and analysis, education and outreach, and research and development. The overarching purpose of U.S. IOOS is to address regional and national needs for ocean, coast, and Great Lakes data and information. The Great Lakes Observing System (GLOS), one of the 11 IOOS regional coastal ocean observing systems, provides public access to critical, real-time and historical data and information about the Great Lakes, St. Lawrence River and interconnecting waterways for use in managing, safeguarding and understanding these immensely valuable freshwater resources. GLOS is intended to gather and integrate chemical, biologic and hydrologic data, and monitor lake conditions and trends over time.

National Ocean Service (NOS) - Regional Geodetic Advisor
The Regional Geodetic Advisor is a National Ocean Service (NOS) employee that resides in a region and serves as a liaison between the National Geodetic Survey (NGS) and its public, academic and private sector constituents within their assigned region. NGS has a Regional Geodetic Advisor stationed in Ann Arbor, MI serving the great lakes region – Illinois, Indiana, Michigan, and Wisconsin The Geodetic Advisor provides training, guidance and assistance to constituents managing geospatial activities that are tied to the National Spatial Reference System (NSRS), the framework and coordinate system for all positioning activities in the Nation. The Geodetic Advisor serves as a subject matter expert in geodesy and regional geodetic issues, collaborating internally across NOS and NOAA to ensure that all regional geospatial activities are properly referenced to the NSRS.

National Marine Fisheries Service (NMFS) and National Ocean Service (NOS) - Damage Assessment, Remediation, and Restoration Program
NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP) assesses and restores habitat, fisheries, protected species and recreational uses that have been harmed by oil spills, chemical releases, and ship groundings. Working with federal, state, and tribal entities, and responsible parties, we have recovered funding from responsible parties for restoration of critical habitats, fisheries, protected species and recreational uses nationwide. These projects promote recovery of the ecosystem and provide economic benefits from tourism, recreation, green jobs, coastal resiliency, property values and quality of life.

National Marine Fisheries Service (NMFS) - Office of Law Enforcement

NOAA's Office of Law Enforcement is the only conservation enforcement program (Federal or State) that is exclusively dedicated to Federal fisheries and marine resource enforcement. Its mission is to protect global marine resources by enforcing domestic laws and international treaties and obligations dedicated to protecting wildlife and their natural habitat. Our special agents and enforcement officers ensure compliance with these laws and take enforcement action if there are violations. Additionally, the Cooperative Enforcement Program allows NOAA the ability to leverage the resources and assistance of 27 coastal states and U.S. territorial marine conservation law enforcement agencies in direct support of the Federal enforcement mission. Effective fisheries law enforcement is critical to creating a level playing field for U.S. fishermen and enabling sustainable fisheries to support vibrant coastal communities. The Office of Law Enforcement's Northeast Division is headquartered in Gloucester, Massachusetts, with a Michigan field office in Ann Arbor.

NOAA Office of Education — Environmental Literacy Program
NOAA's Environmental Literacy Program (ELP), administered by the Office of Education, provides grants and in-kind support to advance NOAA's mission through formal (K-12) and informal education. In Michigan, ELP supports the Great Lakes Bowl in Michigan, one of 25 regional competitions of the National Ocean Sciences Bowl (NOSB). The NOSB is an academic competition that engages high school students in learning about ocean sciences and related STEM careers while helping them become knowledgeable citizens and environmental stewards. ELP supports the American Meteorological Society's DataStreme courses for K-12 educators through a grant and in-kind support. These courses use weather, climate, and the ocean as contexts for teaching science and improving understanding about the Earth system.

Office of Oceanic and Atmospheric Research (OAR) – Michigan Sea Grant
The National Sea Grant College Program (Sea Grant) is a federal-university partnership administered by NOAA that integrates research, extension outreach, and education. Sea Grant forms a national network of 34 programs in all U.S. coastal and Great Lakes states, Puerto Rico, and Guam. Michigan Sea Grant College Program promotes better understanding, conservation and use of Michigan's coastal resources. The program supports research, education and outreach efforts designed to foster science-based decisions about the use and conservation of Great Lakes resources. Michigan Sea Grant is in the heart of one of the most biologically diverse freshwater ecosystems in the world. With more than 3,288 miles of Great Lakes shoreline, 11,000 inland lakes and 36,000 miles of rivers — water is what makes Michigan a special place. The Great Lakes are not just a "local" issue, housing about one-fifth of the world's fresh surface water supply, and nine-tenths of the U.S. supply. A collaborative effort of University of Michigan and Michigan State University, Michigan Sea Grant supports efforts in coastal regions throughout the state. The program was established in 1969 at the University of Michigan. Administrative offices are located in Ann Arbor and East Lansing.

Office of Oceanic and Atmospheric Research (OAR) - Science On a Sphere® - See Page 2 for detail.

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network
The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including Alpena, MI. The Alpena station measures/records wind speed, max wind speed, wind direction, and air temperature, and wind chill at 2-minute increments updated twice per hour. In addition there is a webcam with four views, images are updated six times per hour, six hour animation loops of these images are also posted.

National Ocean Service (NOS) - Students for Zero Waste Week
Students are inviting their local communities to "Go Green and Think Blue" by joining them in the annual *Students for Zero Waste Week campaign*. During this campaign led by the Office of National Marine Sanctuaries, students focus on reducing land-based waste in order to protect the health of local marine environments. These young leaders are raising awareness of how single-use plastic and other types of litter affect the health of local watersheds, national marine

sanctuaries, and the ocean. In addition, some schools are looking at ways to reduce their energy use on campus with hopes of raising awareness of how the burning of fossil fuels also impacts the health of the ocean.

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